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ABSTRACT

By providing the instructor with a nearly limitless surface to write on and the opportunity to simultaneously face students and project a graphic display on an overhead screen, the overhead projector has provided the teacher with an opportunity to improve the clarity of his instruction and to make class presentations more stylish and interesting. The use of the overhead projector is enhanced by mastering a few basic techniques and by preparing appropriate visual displays. Techniques for generating quality graphics are discussed. (EMH)

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1. Introduction

Many teaching departments now own overhead projectors. They are increasingly used, which is understandable as there seems little doubt that the overhead projector is one of the most useful and versatile teaching devices to have become established over the last decade. In many lecture and seminar rooms the black board has now become obsolete.

The advantage of using an overhead projector instead of a black board is that the surface area is almost limitless. In addition, it is cleaner and the teacher faces the students at all times. It is simpler for the teacher to copy diagrams from notes when working at the overhead projector than when at the black board. Reference can easily be made to material that has been prepared perhaps several lectures previously. The absentee student can make use of this facility himself.

Material that has been prepared in advance may be used as an alternative to the projector slide and indeed has many advantages over it. The room does not require darkening and the flow of the presentation is therefore not interrupted. There are none of the problems regarding order, timing and orientation of material that too often occur between the lecturer and the projectionist. Material can be produced at short notice by the speaker himself when the time restrictions placed by processing would make slide production impossible, a great advantage when a lecture or talk has to be given at short notice. The material on the stage of the overhead projector can be manipulated, added to, or altered in a way that is not possible with the lantern slide.

2. Choosing an Overhead Projector

If an overhead projector is not already available, the following remarks may assist you in choosing a machine.

The majority of modern designs are good and there is little to choose between the many models available.

In making a final choice the following points are important.

1. Both surfaces of the Fresnel lens and glass platten should be readily accessible for cleaning.
2. The projection lamp should be of a type readily available in this country.
3. The cooling blower should be as silent as possible.
4. The post holding the projection lens should not encroach on the area of the stage.
5. The focal length of the projection lens should be suitable for the intended position of the projector. The size of the projected image on the screen should be at least one-sixth of the distance from the back of the room to the screen.
6. It is desirable to be able to switch off the blower motor after the lamp has been switched off. (see later)
7. Registration pegs should be fitted.
8. An acetate roll should be fitted as standard.
9. Ideally, there should be minimal light fall-off at the corners of the projected picture.

Most important, on delivery the projector should be checked to make certain that focus is maintained over the entire picture area. Correction of errors of collimation seem beyond the skills of some local service agents, and if a projector is once accepted with this fault it is unlikely that it will ever be made to work satisfactorily.

Many overhead projectors have thermostatically controlled blowers which continue to operate for some time after the lamp has been switched off. This is a nuisance: the cessation of the noise when the thermostat operates is very distracting in a quiet classroom, and the speaker may temporarily loose the attention of his class as a result. If the blower cannot be controlled manually at the machine, and if the switch at the outlet is not to hand, a cable switch should be wired in circuit close to the projector. However with some projectors if the fan does not run on after switching off the lamp, the fresnel lens may overheat and its flat shape may be altered.

Further points one should look at when choosing an overhead projector are discussed in the USER Specification published by the Council for Educational Technology.

3. Maintenance

Dust covers are of little value and stop teachers from using the projector; covers should never be seen in a lecture theatre. The main dust problem is the plastic Fresnel lens which electrostatically attracts dust.

ICI produce an anti-static cream for polishing plastic surfaces. More expensive machines use an aspherical reflector which produces the necessary parallel rays of light without the need for a Fresnel screen. The lens should be cleaned from time to time with a moist pad and detergent cleaner. The glass platten, the objective lens and the lamp reflector should also be kept clean. The halogen-quartz projection lamps have an envelope which is affected by moisture from the fingers. The lamps should not be handled. They should be changed by gripping them through a sleeve of paper or polythene.

4. Positioning the Overhead Projector

If use of the overhead projector is to be encouraged, it must be kept with its screen permanently mounted in the classroom, and be plugged in. It should be uncovered and ready for use, and have immediately at hand suitable writing materials. Everyone should have a clear view of the screen, and there are two common positions for the equipment: a) with the overhead projector built into or placed on a central rostrum or desk, the screen directly facing the audience; b) with the screen placed obliquely in a corner of the classroom, and the overhead projector in a corresponding position in front. Of these positions the first is preferable. The screen should have its upper edge tilted forwards to avoid trapezium, or keystone distortion of the projected image, and many commercial screens have this facility. *Note carefully that the classroom does not need to be darkened, unless it is desired to use the machine for projecting radiographs.* The machine was designed for daylight operation.

5. General Techniques and Hints

1. USE THE SWITCH

Switch on when you are going to use the machine; switch off or mask the stage when you want to reclaim the full attention of the class. Switch on the machine when you want the students' attention back to the notes or diagram on the overhead projector.

2. DRAWING

Keep your lecture notes and rough sketches at the side of the overhead projector. It may be easier to copy diagrams than to recreate them from memory.

3. POINTING

Use the pen as a pointer on the overhead projector stage, but otherwise do not wave it around.

4. UNDERLINING

The pen can be laid down on the overhead projector to underline a sentence or word on which you are expounding.

5. SILHOUETTING

Objects laid on the stage are silhouetted, and this can sometimes be used to advantage - for example, a Smith-Petersen nail may be placed over a rough sketch of a fractured femoral neck when the fixation of these fractures is being discussed.

6. Writing Materials for use with the Overhead Projector

Writing and drawing in front of the class is usually done on a roll of acetate, which should be kept permanently in position. This should be used in a disposable fashion. The roll may be mounted in an East-West or North-South running position on most projectors; probably the latter position is the most desirable.

For writing and line drawing the best results are obtained using a technical pen with suitable ink. This gives ideally an unbroken, even line which is completely opaque and unaffected by the warmth of the overhead projector stage.

A suitable choice is a Staedtler Mars 700 pen with a 0.5 point, with Pelikan 50 Special Black ink. The point of this pen consists of a tiny tube enclosing a stylet to which is attached a small weight. If the ink fails to flow, the pen should be gently shaken until the weight can be heard clicking freely. These pens can dry up, and require regular checking. A clogged up pen can, however, be fairly quickly stripped and cleaned. As a second best, fibre-tipped pens developed for the overhead projector may be used (e.g. Staedtler Lumocolor 315 and 317, or Schwan Stabilo pens). Fibre tipped pens are available in colours as well as in black.

For filling larger areas of colour there are broad tipped pens such as Staedtler Lumocolor models 355 and 357. The inks in these pens may be water or spirit soluble, and in the models quoted the first number refers to the water soluble type. Water

soluble inks can be erased using a small pad of cotton wool soaked in water. Special eraser solutions and pens are available for spirit based inks. On the whole the spirit based inks give the most consistent results.

Propelling pencils of translucent wax are also useful for colouring, (Staedtler Lumocolor 778). In anatomical diagrams skeletal parts can be sketched using a Mars technical pen and wax Lumocolors can be used to colour in muscles, tendons and vessels. If large areas are shaded in with spirit or water soluble inks, there is a tendency to curtaining and the final appearance is flat. If properly used, wax pencils (although not very popular) can give a better appearance of depth. Teachers who use the overhead projector frequently should always carry a technical pen; by using it for normal everyday writing as well, this can ensure that it is always available in working order.

USER Specification No 11 deals with pen and inks for use with overhead projector transparencies.(2)

7. Prepared Materials for use with the Overhead Projector

Lists, graphs, diagrams and drawings can be prepared in advance of a lecture, and subsequently used repeatedly. Some prepared material for use with the overhead projector is available commercially although most users will prefer to prepare their own.

1. Base Material

Acetate is available in sheets of different thicknesses. The thickest sheets are of greatest durability.

2. Lettering

Lettering may be carried out using technical pens and stencils. Staedtler produce an excellent range of stencils which can be used with their pens. Letraset produce self-adhesive transfer letters and numbers in various sizes and colours for overhead projector use. Special acetate sheets are available on which one can type directly.

3. Lining

Ordinates of graphs, underlining, etc. may be done with self-adhesive material in roll form. Lines are available in varying widths and colours. Chartpak Rotex tape pens can be recommended.

4. Colouring

Lines and small areas may be coloured with the materials already described. For larger areas, where even distribution of the colour is required, transparent colour film may be laid on

the acetate sheet. A good range is available (Bourges Cutocolor can be recommended). The technique is to cut from the sheets supplied, a piece a little larger than the area required, the protective backing is then removed and the film lowered into position, carefully smoothing out the wrinkles and trimming off excess film with a sharp pointed knife.

Coloured parts to be moved on the sheet can be cut from tinted gelatin or Cinemoid sheets (obtainable from stage lighting sources) or from translucent acrylic sheet (e.g. Perspex).

5. Copying Material on to Transparencies

Diagrams, instead of being prepared directly on the acetate, may be made of paper and transferred to special transparent sheets by a suitable machine. Copying machines capable of handling this work are made by 3M, Banda, Xerox etc. and colour can be introduced. Certain models are able to reproduce diagrams directly from books. Full-tone illustrations for the overhead projector may be made using ordinary photographic techniques: the illustration is photographed and a positive transparent print of overhead projector size made from the negative using special large format film. A large variety of colours may be reproduced using Diazo techniques. Materials for this process are available from a number of manufacturers (e.g. Banda).

6. Mounting

For preservation of good material the sheet should be fixed to a mount. Mounts are available in plastic and cardboard. In choosing mounts, take the strongest available, and make

sure the registration holes correspond with the pegs on the overhead projector. The surface of the prepared material may be protected by laying a clear sheet of acetate on top. Radiographs may be protected from scratching by sandwiching them between acetate sheets. Acetates should be secured to the mounts using sellotape. Masking tape is less satisfactory as it tends to peel off more quickly than sellotape.

7. Using Prepared Sheets

When using prepared sheets they may be placed under the roll of acetate on the overhead projector. Additions may then be made to diagrams, or parts circled or underlined, without affecting the master drawing as the additions are made on the disposable roll. The master can then be removed unmarked for future use.

A thin sheet of paper placed on top of the illuminated material can be used to cut off part of the projected image when it is felt desirable to reveal the information a section at a time. In addition, the concealed part is still clearly seen by the lecturer because of the intensity of the illumination, and acts as a useful prompt for him.

8. Other Techniques

1. Overlays

The basic idea of an overlay is simple, but the variations and versatility of the concept largely contribute to the great usefulness of the overhead projector as a teaching device.

An overlay is a separate sheet or portion of a sheet of acetate which carries additional information: this is added to the main drawing or diagram. For example, an overlay of blood vessels can be placed over a diagram of a limb.

In practice, the main drawing or material is fixed to a cardboard mount. The additional material is registered and then hinged down one side with sellotape. In use, the overlay is folded to one side away from the projection area, and when required is turned over to lie flat on the stage. More overlays can be used with the one master, and the range of possibilities is great.

Some examples:

To the ordinates of a graph may be added two tracings, on separate overlays. They can be studied separately or compared.

Normal and abnormal Circulatory patterns can be added to a drawing of a part.

Overlays can be used to show alterations in gastro-intestinal routing following surgery.

Overlays can be used to illustrate prosthetic replacement of parts.

2. Using Detached Moveable Parts

Coloured or opaque pieces can be moved on the bare stage of the overhead projector, or in relation to a prepared diagram, e.g. in demonstrating genetic patterns, statistics or the relative movements of parts in fractures and dislocations.

3. Using Articulated Parts

Articulated models using acrylic materials can be made to illustrate a wide variety of concepts. It is possible to show the major part of the musculo-skeletal system in health and disease in this way. Elastic bands representing muscles produce movement of the articulated parts in the pattern determined by their origins and insertions. Bands attached to cords can act as muscle tendon units.

Acrylic models with elastic bands have also been used to demonstrate shortening of limbs due to tissue contracture after a fracture, the effects of traction, and of devices such as the Thomas splint.

4. Polarising Materials

When two polarising filters are orientated in the same plane, they pass light; if one of the pair is rotated through ninety degrees, they cut it off. Isolated pieces of polarising material, if incorporated in a design, can be made to pass or obstruct transmitted light if a sheet of polarising material is suitably orientated on the stage or elsewhere in the light path. This effect has a limited usefulness in certain diagrams. Two improvements help to make the basic principle a valuable one. Firstly, specially prepared polarising

materials are used on the diagrams, and secondly, the second filter is rotated mechanically. By these means a wide variety of animated effects can be produced. Self-adhesive sheets offering a wide variety of effects are now available commercially, and polarising spinners can be made or purchased. Using this technique it is possible to animate in a very graphic way arterial, venous and lymphatic flows in the limbs, circulation through the heart and other organs, etc.. This method may be used to show the flow of impulses along nerves, synaptic firing, and many other effects.

5. Physical Phenomena

A number of basic physical phenomena can be demonstrated clearly on the overhead projector. Special transparent voltmeters and ammeters are available.

6. Chemical Experiments

Because of the fairly generous depth of focus of the overhead projector, it is possible to conduct a large number of experiments, using a wide variety of special flat containers, collection jars, etc. directly on the overhead projector stage. This technique has been developed to a very high degree indeed in America. Teachers interested in this method should consult the large range of specialised literature on this subject, and choose an overhead projector which has facilities for being used (with a suitable commercial attachment) with the stage in the vertical plane.

7. Projection of Radiographs

Many radiographs can be projected successfully with the overhead projector. For this pur-

pose the classroom, however, must be darkened. As much as possible of the radiograph should be masked off, so that there are no bright patches of light beyond the area of interest. Where a radiograph sheet is smaller than the projection stage, it is desirable to mask off the unused area. Success is unlikely with dense radiographs. Some companies produce special (expensive) radiograph overhead projectors (e.g. Leitz and ITM).

9. Additional Information

The National Audio Visual Aids Centre, 254 Belsize Road, London NW6 4BT, telephone 01-624-8812, has an extensive permanent display of overhead projectors and other audio visual equipment and materials. An appointment should be arranged for personal attention during a visit. Enquiries can be dealt with on the telephone and by letter.

New information on equipment methods and available teaching/learning materials for overhead projectors is published in a number of journals, including:

Information: (Department of Audio Visual Communication, British Medical Association and British Life Assurance Trust for Health Education, BMA House, Tavistock Square, London WC1H 9JP.

Visual Education: (National Committee for Audio Visual Aids in Education, 33 Queen Anne Street, London W1M 0AL)

Technical pens, Letraset, stencils, etc. are available in most good art and technical drawing shops.

Supplies of materials for overhead projectors can be obtained from a number of sources, including:

Transart, East Chadley Lane, Godmanchester, Huntingdon.

Louis Newmark Technamation Ltd, 101 Bell Street, Reigate, Surrey, (spinners and polarising equipment).

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11. Tape Slide Presentations

How to use the Overhead Projector.

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Medical Recording Service Foundation, Kitts Croft,
Writtle, Chelmsford.

Catalogue No 71/56, 53 slides, 30 minutes.

Working Models for the Overhead Projector.

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Medical Recording Service Foundation, Kitts Croft,
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Catalogue No 71/57, 44 slides, 28 minutes.

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